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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

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(PCT Article 36 and Rule 70)

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| Applicant's or agent's file reference 2020822PC/ko | FOR FURTHER ACTION See Form PCT/IPEA/416 | |
| International application No. PCT/FI 2003/000442 | International filing date (<i>day/month/year</i>) 04.06.2003 | Priority date (<i>day/month/year</i>) 05.06.2002 |
| International Patent Classification (IPC) or national classification and IPC B29C 44/32, B30B 5/06 | | |
| Applicant FASEC OY et al | | |

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
 - a. ☒ (*sent to the applicant and to the International Bureau*) a total of 4 sheets, as follows:

☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - b. ☐ (*sent to the International Bureau only*) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |

| | |
|---|---|
| Date of submission of the demand 31.12.2003 | Date of completion of this report 08.09.2004 |
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Form PCT/IPEA/409 (cover sheet) (January 2004)

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International Application No.

PCT/FI 2003/000442

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

- ☐ This report is based on a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-13 _____ as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☒ the claims:
- pages _____ as originally filed/furnished
- pages* _____ as amended (together with any statement) under Article 19
- pages* 14-17 received by this Authority on 03.06.2004
- pages* _____ received by this Authority on _____
- ☒ the drawings:
- pages 1-3 _____ as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International Application No.

PCT/FI 2003/000442

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|--------|-------------|-----|
| Novelty (N) | Claims | <u>1-19</u> | YES |
| | Claims | _____ | NO |
| Inventive step (IS) | Claims | <u>1-19</u> | YES |
| | Claims | _____ | NO |
| Industrial applicability (IA) | Claims | <u>1-19</u> | YES |
| | Claims | _____ | NO |

2. Citations and explanations (Rule 70.7)

Amended claims 1-19 were filed together with a statement on the 2004-06-03

The following documents were cited in the International Search Report:

D1: DE2005304 A1

D2: US3860371 A1

D1 describes a method and apparatus for making plate-like fibre-reinforced composite products. According to the method, a liquid resin for hard foam is applied on a mat of fibre material. The mix is fed into a form between the upper and lower pressing plates of an endless rotating continuous press. The resin is allowed to foam under pressure in the press so that a plate-like product of a predefined cross-section is achieved (page 4-5, lines 17-5).

The method according to claim 1 differs from D1 in that it defines that the fibre mat is a three-dimensional cohesive fibre mat with 80% of the fibres having a length of at least 100 mm. The fibres are provided with a moisture content of 5% and pressed at a pressure of at least 0.8 bar and 5 bar at the most. The resulting plate has a high bending strength.

The apparatus according to claim 12 differs from the apparatus described in D1 in that it comprises pressing means for creating a pressure of at least 0.8 bar and that its feeding means are adapted to rotate the upper and lower laminate in endless paths.

.../...

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Box V

D2 describes a fibre-reinforced foam filled sheet product. The sheet comprises a three-dimensional mat of non-woven fibres surrounded by a foam matrix (column 1, lines 35-52, figures 3, 4).

The plate-like fibre-reinforced product according to claim 17 differs from D2 in that it specifies a stable product comprising a three-dimensional fibre mat where 80% of the fibres are of a length of at least 100mm. Claim 17 also specifies that the weight ratio between the fibres and the binding agent is small i.e. between 0.8 and 2.

Consequently, the method for making a plate-like fibre-reinforced composite product according to claim 1 and the apparatus according to claim 12 and the plate-like product according to claim 17 is novel and considered to involve an inventive step.

Accordingly, the invention according to claims 1 - 19 is novel and considered to involve an inventive step. The invention fulfils the requirement of industrial applicability.

CLAIMS

1. A method for making a plate-like fibre-reinforced composite product to be used as building or packing material, the method comprising
- 5 placing fibres on a lower laminate,
- applying a foaming hardening binding agent in liquid form on the fibres so that the fibres are surrounded by the binding agent,
- transferring the fibres with binding agent between the lower laminate and an upper laminate between lower and upper pressing plates arranged to rotate endlessly on the upper, respectively the lower, side of the fibres with the
- 10 binding agent so that the fibres with the binding agent are transferred by means of the rotation speed of the pressing plates, allowing the binding agent to foam up, expand and harden between the upper and lower pressing plates, and
- removing the laminates from the hardened product, **characterized** by the steps of
- 15 preparing the fibres into a three-dimensional cohesive fibre mat of fibres bound together, the thickness of which basically ranges between 0.5 and 0.8 mm and the width between 0.3 and 2 mm, and the length of at least 80% of the fibres is at least 100 mm before the binding agent is applied onto the fibre
- 20 mat,
- providing the fibre mat with a moisture content of 5% at the most before the binding agent is applied onto the fibre mat,
- applying the binding agent onto the fibre mat so that a mixture of fibre mat and binding agent is obtained, the mixture comprising fibres close to
- 25 the upper surface thereof, which is turned against the upper pressing plates, and close to the lower surface thereof, which is turned against the lower pressing plates,
- endlessly rotating the lower and the upper laminate between which the mixture of fibre mat and binding agent is guided, and
- 30 placing the mixture under a pressure of at least 0.8 bar and 5 bar at the most and allowing, before the laminates are removed, the mixture to harden into a plate-like product having a thickness of 10 to 150 mm and comprising fibres close to the upper surface thereof and close to the lower surface thereof when transferring the mixture between the pressing plates.

2. A method as claimed in claim 1, **characterized** in that the thickness of the fibre mat before applying the binding agent thereto is approximately 1.5 to 3 times the thickness of the final product.

5 3. A method as claimed in claim 1, **characterized** in that the fibre mat is made of hygroscopic fibres.

4. A method as claimed in claim 1, 2 or 3, **characterized** in that the foaming binding agent is applied onto a fibre mat having a moisture content of 3% at the most.

10 5. A method as claimed in claim 1, **characterized** in that the mixture of fibres and binding agent is subjected to a pressure of 1 to 2 bar at the most.

6. A method as claimed in claim 1, **characterized** in that a material with a good adhesiveness is used as binding agent.

15 7. A method as claimed in claim 4, 5 or 6, **characterized** in that polyurethane is used as binding agent.

8. A method as claimed in claim 6, **characterized** in that a phenol-based material is used as binding agent.

9. A method as claimed in claim 1 or 7, **characterized** in that the fibres comprise wood fibres.

20 10. A method as claimed in claim 7, **characterized** in that the fibre mat including the polyurethane is transferred between the pressing plates at a temperature ranging between 30 and 90 degrees Celsius.

11. A method as claimed in claim 11, **characterized** in that the binding agent is applied onto the fibre mat by means of spray nozzles.

25 12. An apparatus for making a plate-like fibre-reinforced composite product to be used as building or packing material, the apparatus comprising an inlet end (10) for receiving fibres surrounded by binding agent, an outlet end (11) for providing the plate-like fibre-reinforced composite product manufactured in the apparatus,

30 an upper endlessly rotating belt (1) comprising a plurality of upper pressing plates (3), which controlled by at least two elongated control elements (32) extending in the longitudinal direction of the apparatus are arranged to move on an upper endless track, and a lower endlessly rotating belt (2) comprising a plurality of lower pressing plates (4), which controlled by at least two elongated control elements (32) extending in the longitudinal direction of the
35 apparatus are arranged to move on a lower endless track, whereby the upper

elongated control elements (32) extending in the longitudinal direction of the apparatus are arranged to move on a lower endless track, whereby the upper pressing plates within an area of the upper endless track are arranged on a first substantially flat plane and the lower pressing plates within an area of the lower endless track are arranged on a second substantially flat plane, which is parallel to the first flat plane, whereby the upper and lower pressing plates within the area are arranged to transfer the fibres surrounded by the binding agent between them,

feed means (13 to 16, 18 to 21) for feeding an upper laminate (12) and a lower laminate (17) in said area, the upper laminate (12) is arranged to be supported in said area against the upper pressing plates (3) and to move at the same speed as the upper pressing plates, and the lower laminate (17) is arranged to be supported in said area against the lower pressing plates (4) and to move at the same speed as the lower pressing plates,

collecting means (13 to 16, 18 to 21) for collecting the upper and lower laminate (12, 17) from the plate-like composite product manufactured in the apparatus,

application means (24) at the inlet end (10) for applying fibres including binding agent in liquid form onto the lower laminate (17), and

heating means (30, 31) for heating the mixture of fibres and binding agent, **characterized by**

the length of said area being 5 to 30 m and the width thereof 1 to 5 m,

the apparatus comprising pressing means (9) for creating a pressure of at least 0.8 bar towards the pressing plates (3, 4),

the upper pressing plates (3) of the apparatus being arranged at a distance of 10 to 150 mm from the lower pressing plates (4), and

said feeding means being adapted to rotate the upper laminate (12) and the lower laminate (17) in endless paths.

13. An apparatus as claimed in claim 12, **characterized** in that the pressing plates (3, 4) comprise a flat surface turned against the laminates (16, 17) and gripping parts (38) to co-operate with endless drive elements (35) belonging to the feed means that are arranged to be controlled by the control elements (32).

14. An apparatus as claimed in claim 12, **characterized** in that the upper and lower laminate (17) is made of polyethylene foil.

15. An apparatus as claimed in claim 12, **characterized** in that the application means comprise at least a spray nozzle (24) arranged to sweep back and forth in the transverse direction in relation to the longitudinal direction of the apparatus.

5 16. An apparatus as claimed in claim 12, **characterized** in that the heating means (30, 31) comprise heating means arranged to heat the upper and lower pressing plates (3, 4) to a temperature ranging between 30 and 100 degrees Celsius.

10 17. A plate-like fibre-reinforced composite stable product comprising fibres surrounded by a binding agent to be used as building or packing material, the composite product comprising fibres close to the upper and lower surface of the product, **characterized** in that

the fibres are in a form resembling a three-dimensional cohesive mat,

15 the thickness of the fibres mainly ranges between 0.5 and 0.8 mm and the width between 0.3 and 2 mm, and the length of at least 80% of the fibres is at least 100 mm,

the weight ratio between fibres and binding agent ranges between 0.8 and 2 and that the thickness of the plate-like product is 10 to 150 mm..

20 18. A plate-like fibre-reinforced composite product as claimed in claim 17, **characterized** in that the binding agent is polyurethane.

19. A plate-like fibre-reinforced composite product as claimed in claim 18, **characterized** in that the product is not covered.